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WO-Patent Application No.: PCT/IB2005/000838
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New claims

1. An exhaust gas control apparatus for an internal combustion engine, comprising:
a catalyst which is provided in an exhaust passage of an internal combustion engine and which has an oxidizing ability;
a supercharger which includes a turbine that is provided in the exhaust passage at a position upstream of the catalyst and that is rotated by exhaust gas, and a compressor that is rotated in accordance with rotation of the turbine and that performs supercharging;
turbine rotation energy amount adjusting means for adjusting an amount of energy of the exhaust gas, which is used for rotating the turbine; and
after-injection performing means for performing after-injection for injecting fuel after main fuel injection in order to increase a temperature of the exhaust gas released from the internal combustion engine and flowing in the catalyst,
wherein when a work amount of the compressor is increased due to the after-injection performed by the after-injection performing means, the turbine rotation energy amount adjusting means decreases the amount of energy taken from the exhaust gas for rotating the turbine in order to decrease the increase in the work amount due to the after injection to zero.

2. The exhaust gas control apparatus according to claim 1, wherein the turbine rotation energy amount adjusting means decreases the amount of energy of the exhaust gas, which is used for rotating the turbine, by increasing an opening amount of a variable nozzle provided in the supercharger and/or an opening amount of a wastegate valve.

3. The exhaust gas control apparatus according to claim 2, wherein the after-injection performing means decides an amount of fuel injected by the after-injection based on a temperature at which the catalyst is activated, and wherein the turbine rotation energy amount adjusting means increases the opening amount of the variable nozzle provided in the supercharger and/or the opening amount of the wastegate valve as the amount of fuel injected by the after-injection increases.

4. The exhaust gas control apparatus according to any one of claims 1 to 3, wherein at least one of intake air amount detecting means for detecting an amount of intake air flowing through an intake passage of the internal combustion engine and intake air pressure detecting means for detecting a pressure of the intake air is further provided in the intake passage of the internal combustion engine, and wherein the turbine rotation energy amount adjusting means decreases the amount of energy of the exhaust gas, which is used for rotating the turbine, when a value detected by the intake air amount detecting means or the intake air pressure detecting means after the after-injection is performed is higher than a value detected by the intake air amount detecting means or the intake air pressure detecting means before the after-injection is performed.

5. An exhaust gas control method for an internal combustion engine including a catalyst which is provided in an exhaust passage of an internal combustion engine and which has an oxidizing ability; a supercharger which includes a turbine that is provided in the exhaust passage at a position upstream of the catalyst and that is rotated by exhaust gas, and a compressor that is rotated in accordance with rotation of the turbine and that performs supercharging; turbine rotation energy amount adjusting means for adjusting an amount of energy of the exhaust gas, which is used for rotating the turbine; and after-injection performing means for performing after-injection for injecting fuel after main fuel injection in order to increase a temperature of the exhaust gas released from the internal combustion engine and flowing in the catalyst, wherein when a work amount of the compressor is increased due to the after-injection performed by the after-injection performing means, the turbine rotation energy amount adjusting means decreases the amount of energy taken from the exhaust gas for rotating the turbine in order to decrease the increase in the work amount due to the after injection to zero.

6. The exhaust gas control method according to claim 5, wherein the turbine rotation energy amount adjusting means decreases the amount of energy of the exhaust gas, which is used for rotating the turbine, by increasing an opening amount of a variable nozzle provided in the supercharger and/or an opening amount of a wastegate valve.

7. The exhaust gas control method according to claim 6, wherein the after-injection performing means decides an amount of fuel injected by the after-injection based on a temperature at which the catalyst is activated, and

wherein the turbine rotation energy amount adjusting means increases the opening amount of the variable nozzle provided in the supercharger and/or the opening amount of the wastegate valve as the amount of fuel injected by the after-injection increases.

8. The exhaust gas control method according to any one of claims 5 to 7, wherein at least one of intake air amount detecting means for detecting an amount of intake air flowing through an intake passage of the internal combustion engine and intake air pressure detecting means for detecting a pressure of the intake air is further provided in the intake passage of the internal combustion engine, and

wherein the turbine rotation energy amount adjusting means decreases the amount of energy of the exhaust gas, which is used for rotating the turbine, when a value detected by the intake air amount detecting means or the intake air pressure detecting means after the after-injection is performed is higher than a value detected by the intake air amount detecting means or the intake air pressure detecting means before the after-injection is performed.

9. An exhaust gas control apparatus for an internal combustion engine, comprising:

a catalyst which is provided in an exhaust passage of an internal combustion engine and which has an oxidizing ability;

a supercharger which includes a turbine that is provided in the exhaust passage at a position upstream of the catalyst and that is rotated by exhaust gas, and a compressor that is rotated in accordance with rotation of the turbine and that performs supercharging;

a turbine rotation controller that adjusts an amount of energy of the exhaust gas, which is used for rotating the turbine; and
an injection controller that performs after-injection for injecting fuel after main fuel injection in order to increase a temperature of the exhaust gas released from the internal combustion engine and flowing in the catalyst, wherein when a work amount of the compressor is increased due to the after-injection performed by the injection controller, the turbine rotation controller decreases the amount of energy taken from the exhaust gas for rotating the turbine in order to decrease the increase in the work amount due to the after injection to zero.

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